

S/N 10/683,817

Response to Office Action Mailed 01/13/2006

**In the Claims**

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2 1. (Currently Amended) An encoding system for determining position and  
3 position changes of a moving member, comprising:

4 a sequence of encoder marks forming incremental patterns and at least one  
5 index pattern, wherein two subsequent incremental patterns are indicative of an  
6 incremental position-change of the moving member and the index pattern is  
7 indicative of a reference position of the moving member;

8 a sensor ~~arrangement viewing~~ configured to view a section of the encoder-  
9 mark sequence, wherein the viewed section of the encoder-mark sequence carries  
10 redundant incremental position-change information at least in regions not  
11 disturbed by the index pattern the length of which is greater than one position-  
12 change increment; and

13 an analyzer arranged to analyze an encoder-mark pattern in the viewed  
14 section with regard to the incremental patterns and the index pattern and to  
15 generate, in response to a pattern match found, an incremental-position-change  
16 signal and an index signal.

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18 2. (Currently Amended) The encoding system of claim 1, wherein the  
19 ~~sensor arrangement comprises a plurality of sensor elements arranged to~~  
20 ~~simultaneously detect a plurality of encoder marks in the section of the encoder-~~  
21 ~~mark sequence~~ analyzer verifies a correlation between the viewed section and the  
22 index pattern to be higher than a threshold as a condition of the index signal.  
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1           3. (Currently Amended) The encoding system of claim 1, wherein ~~the index~~  
2 ~~pattern has a length, and the length of the viewed section corresponds to the length~~  
3 ~~of the index pattern is larger than a length of the index pattern.~~

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5           4. (Currently Amended) The encoding system of claim 1, wherein  
6 ~~subsequent incremental patterns overlap the analyzer ascertains whether a~~  
7 ~~correlation between the viewed section and the encoder pattern is higher than a~~  
8 ~~threshold as a condition of the incremental-position-change signal.~~

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10          5. (Currently Amended) The encoding system of claim 1, wherein the  
11 ~~analyzer sets a detected pattern to a correct pattern closest to the detected pattern~~  
12 ~~encoder marks are identical.~~

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14          6. (Currently Amended) The encoding system of claim 1, wherein a length  
15 of the viewed section of the sequence of encoder marks is selected according to a  
16 desired robustness system is a linear or an angular of the encoding system.  
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1           7. (Currently Amended) An encoding system for determining position and  
2 position changes of a moving member, comprising:

3           a row of encoder marks arranged along the moving member in a generally  
4 regular manner to provide incremental position-change information;

5           at least one index marking in the form of a predefined pattern of encoder  
6 marks which represents a disturbance of the regular encoder-mark arrangement;

7           a sensor arrangement viewing a section of the row of encoder marks and  
8 arranged to provide a viewed pattern of the encoder-mark section;

9           an analyzer arranged to analyze the viewed pattern to generate incremental-  
10 position-change signals on the basis of the encoder marks and an index signal in  
11 response to a detection of the predefined index mark pattern, wherein the analyzer  
12 verifies a correlation between the viewed section and the index mark pattern to be  
13 higher than a threshold as a condition of the index signal.

14           ~~wherein the incremental position-change signals are enabled to be~~  
15 ~~generated also in that section of the encoder mark row in which the regular en-~~  
16 ~~coder mark arrangement is disturbed by the index marking.~~

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18           8. (Currently Amended) The encoding system of claim 7, wherein  
19 robustness of the encoding system against noise is increased by viewing a longer  
20 section of the row of encoder marks ~~the sensor arrangement comprises a plurality~~  
21 ~~of sensor elements arranged to simultaneously detect a plurality of encoder marks~~  
22 ~~in the viewed encoder mark section.~~

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1           9. (Currently Amended) The encoding system of claim 7, wherein ~~the index~~  
2 ~~marking has a length, and the length of the viewed encoder mark section~~  
3 ~~corresponds to the length of the index marking. incremental-position-change~~  
4 ~~signals are generated by use of the viewed section, even when the viewed section~~  
5 ~~is disturbed by the index mark pattern.~~

6  
7           10. (Original) The encoding system of claim 7, wherein the sensor  
8 arrangement is arranged to detect, in the viewed section, a multiplicity of encoder  
9 marks, so that the detected encoder marks carry redundant incremental position-  
10 change information at least in regions of regular encoder-mark arrangement,  
11 wherein the detection of the multiplicity of encoder marks enables the  
12 incremental-position-change signals to be generated also in that section of the  
13 encoder-mark row in which the regular encoder-mark arrangement is disturbed by  
14 the index marking.

15  
16           11. (Currently Amended) The encoding system of claim 7, wherein ~~the~~  
17 ~~encoder marks are equidistantly spaced in regions of regular encoder mark~~  
18 ~~arrangement~~ the incremental-position-change signals are generated only after  
19 confirming a correlation between the viewed section and an encoder pattern that is  
20 greater than a second threshold.

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22           12. (Currently Amended) The encoding system of claim 7, wherein the  
23 ~~encoder marks are identical. analyzer sets a detected pattern to a correct pattern~~  
24 closest to the detected pattern.  
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2 13. (Currently Amended) The encoding system of claim 7, wherein ~~the~~  
3 ~~system is a linear or an angular encoding system.~~ a length of the viewed section is  
4 larger than a length of the index mark pattern.

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6 14. (Currently Amended) An encoding system for determining position and  
7 position changes of a moving member, comprising:

8 a row of identical encoder marks forming incremental patterns and at least  
9 one index pattern, wherein two subsequent incremental patterns are indicative of  
10 an incremental position-change of the moving member and the index pattern is  
11 indicative of a reference position of the moving member;

12 a sensor arrangement detecting a pattern of a section of the encoder-mark  
13 row;

14 an analyzer arranged to analyze the detected encoder-mark pattern with  
15 regard to the incremental patterns and the index pattern and to generate, in  
16 response to an incremental-pattern match found, an incremental-position-change  
17 signal and, in response to an index-pattern match found, an index signal, wherein  
18 the analyzer verifies a correlation between the section viewed by the sensor  
19 arrangement and the index pattern to be higher than a threshold as a condition of  
20 the index signal.

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1 15. (Currently Amended) The encoding system of claim 14, wherein the  
2 ~~sensor arrangement comprises a plurality of sensor elements arranged to~~  
3 ~~simultaneously detect a plurality of encoder marks in the section of the encoder-~~  
4 ~~mark row.~~ analyzer sets a detected pattern to a correct pattern closest to the  
5 detected pattern.

6  
7 16. (Currently Amended) The encoding system of claim 14, wherein ~~the~~  
8 ~~index pattern has a length, and the length of the viewed section corresponds to the~~  
9 ~~length of the index pattern.~~ a length of the section of the encoder mark sequence  
10 viewed by the sensor arrangement is selected according to a desired robustness of  
11 the encoding system.

12  
13 17. (Original) The encoding system of claim 14, wherein the sensor  
14 arrangement comprises a sensor element arranged to successively detect the  
15 encoder marks or groups of the encoder marks in the section of the encoder-mark  
16 row upon the movement of the moving member, wherein the encoding system is  
17 arranged to combine the successively detected encoder marks to form the detected  
18 encoder-mark pattern.

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20 18. (Original) The encoding system of claim 14, wherein subsequent  
21 incremental patterns overlap.  
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1 19. (Currently Amended) The encoding system of claim 14, wherein the  
2 ~~system is a linear or an angular encoding system. a length of the section of the~~  
3 encoder-mark row viewed by the sensor arrangement is sufficient to enable  
4 incremental-position-change information to be generated even when the section is  
5 disturbed by the index pattern.

6  
7 20. (Currently Amended) A printing device having an encoding system for  
8 determining position and position changes of a recording medium conveyor to  
9 determine the position of a recording medium placed on the conveyor, comprising:

10 a sequence of encoder marks forming incremental patterns and at least one  
11 index pattern, wherein two subsequent incremental patterns are indicative of an  
12 incremental position-change of the conveyor and the index pattern is indicative of  
13 a reference position of the conveyor;

14 a sensor arrangement viewing a section of the encoder-mark sequence, the  
15 length of which is greater than one position-change increment;

16 an analyzer arranged to analyze an encoder-mark pattern in the viewed  
17 section with regard to the incremental patterns and the index pattern and to  
18 generate, in response to a pattern match found, an incremental-position-change  
19 signal and an index ~~signal~~, signal, wherein the incremental-position-change signal  
20 and the index signal are generated only after confirming a correlation greater than  
21 selected thresholds between the viewed section and an incremental pattern or the  
22 index pattern, respectively.

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1           21. (Original) The printing device of claim 20, wherein the recording  
2 medium conveyor is a belt conveyor.

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4           22. (Original) The printing device of claim 20, wherein the encoder-mark  
5 sequence is an encoder-mark row arranged along the recording medium conveyor.

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7           23. (Original) The printing device of claim 20, wherein the printing device  
8 has a plurality of print stations arranged along the recording medium conveyor,  
9 and each print station is individually equipped with said sensor arrangement and  
10 analyzer.

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12           24. (Original) The printing device of claim 20, wherein the printing device  
13 is a page-wide ink-jet printer.



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1           25. (Currently Amended) A printing device having an encoding system for  
2 determining position and position changes of a recording medium conveyor to  
3 determine the position of a recording medium placed on the conveyor, comprising:

4           a row of encoder marks arranged along the conveyor in a generally regular  
5 manner to provide incremental position-change information;

6           at least one index marking in the form of a predefined pattern of encoder  
7 marks which represents a disturbance of the regular encoder-mark arrangement;

8           a sensor arrangement viewing a section of the row of encoder marks and  
9 arranged to provide a viewed pattern of the encoder-mark section;

10           an analyzer arranged to analyze the viewed pattern to generate incremental-  
11 position-change signals on the basis of the encoder marks and an index signal in  
12 response to a detection of the predefined index mark pattern, wherein the analyzer  
13 is configured to extract redundant incremental position-change information from  
14 the viewed section of the row of encoder marks at least in regions not disturbed by  
15 the index pattern,

16           wherein the incremental-position-change signals are enabled to be  
17 generated also in that section of the encoder-mark row in which the regular en-  
18 coder-mark arrangement is disturbed by the index marking.

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20           26. (Original) The printing device of claim 25, wherein the recording  
21 medium conveyor is a belt conveyor.  
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1           27. (Original) The printing device of claim 25, wherein the printing device  
2 has a plurality of print stations arranged along the recording medium conveyor,  
3 and each print station is individually equipped with said sensor arrangement and  
4 analyzer.

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6           28. (Original) The printing device of claim 25, wherein the printing device  
7 is a page-wide ink-jet printer.

8  
9           29. (Currently Amended) A printing device having an encoding system for  
10 determining position and position changes of a recording medium conveyor to  
11 determine the position of a recording medium placed on the conveyor, comprising:

12           a row of identical encoder marks forming incremental patterns and at least  
13 one index pattern, wherein two subsequent incremental patterns are indicative of  
14 an incremental position-change of the conveyor and the index pattern is indicative  
15 of a reference position of the conveyor;

16           a sensor arrangement detecting a pattern of a section of the encoder-mark  
17 row;

18           an analyzer arranged to analyze the detected encoder-mark pattern with  
19 regard to the incremental patterns and the index pattern and to generate, in  
20 response to an incremental-pattern match found, an incremental-position-change  
21 signal and, in response to an index-pattern match found, an index ~~signal-signal~~,  
22 wherein the incremental-position-change signal and the index signal are generated  
23 only after confirming a correlation greater than selected thresholds between the  
24 detected pattern and an incremental pattern or the index pattern, respectively.  
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30. (Original) The printing device of claim 29, wherein the recording medium conveyor is a belt conveyor.

31. (Original) The printing device of claim 30, wherein the encoder-mark row is arranged along the recording medium conveyor.

32. (Original) The printing device of claim 30, wherein the printing device has a plurality of print stations arranged along the recording medium conveyor, and each print station is individually equipped with said sensor arrangement and analyzer.

33. (Original) The printing device of claim 30, wherein the printing device is a page-wide ink-jet printer.

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1        34. (Currently Amended) A method of determining position and position  
2 changes of a moving member using a sequence of encoder marks which forms  
3 incremental ~~pat-terns~~patterns and at least one index pattern, wherein two  
4 subsequent incremental patterns are indicative of an incremental position-change  
5 of the moving member and the index pattern is indicative of a reference position of  
6 the moving member, comprising the steps:

7        viewing a section of the encoder-mark sequence, wherein the viewed  
8 section carries redundant incremental position-change information at least in  
9 regions not disturbed by the index pattern and the length of which the section is  
10 greater than one position-change increment;

11        analyzing a encoder-mark pattern in the viewed section with regard to the  
12 incremental patterns and the index pattern; and

13        generating, in response to a pattern match found, an incremental-position-  
14 change signal and an index signal.

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1 35. (Currently Amended) A method of determining position and position  
2 changes of a moving member using a row of encoder marks arranged along the  
3 moving member in a generally regular manner to provide incremental position-  
4 change information; at least one index marking in the form of a predefined pattern  
5 of encoder marks which represents a disturbance of the regular encoder-mark  
6 arrangement, comprising the steps:

7 viewing a section of the row of encoder marks, wherein the section viewed  
8 has a length selected according to a desired robustness of the encoding system;

9 providing a viewed pattern of the encoder-mark section, wherein the  
10 viewed pattern of the encoder-mark section carries redundant incremental  
11 position-change information at least in regions not disturbed by the index pattern;

12 analyzing the viewed pattern to generate incremental-position-change  
13 signals providing the incremental position-change information on the basis of the  
14 encoder marks and an index signal in response to a detection of the pre-defined  
15 index mark pattern,

16 wherein the incremental-position-change signals are enabled to be  
17 generated also in that section of the encoder-mark row in which the regular  
18 encoder-mark arrangement is disturbed by the index marking.